A COMPARATIVE ANALYSIS
OF
TRAINING AND QUALIFICATION PROGRAM
REQUIREMENTS OF
DOE NUCLEAR FACILITIES
AND
COMMERCIAL NUCLEAR PLANTS

(DOE 5480.20A)

December 1994

FOREWORD

This report compares Department of Energy (DOE) selection, qualification, and training requirements for personnel at DOE reactor and non-reactor nuclear facilities to similar Nuclear Regulatory Commission (NRC) requirements and guidance for personnel at NRC-regulated nuclear power reactors, test and research reactors (non-power reactors), and production facilities.

The Department used NRC requirements and guidance, where available, as a benchmark for establishing DOE selection, qualification, and training requirements for DOE reactor and non-reactor nuclear facilities. A review of the detailed comparisons provided in Sections 1, 2, 3, and 4 of this report shows that DOE Category A and B reactor and non-reactor nuclear facility minimum education and training requirements parallel, and in many cases exceed, NRC regulatory requirements and guidelines for commercial nuclear reactor plants and nuclear production facilities.

When developing selection, training, and qualification requirements, DOE related Category A reactors to commercial power reactors, Category B reactors to non-power reactors, and non-reactor nuclear facilities to production facilities. DOE Category A and Category B reactors would be considered non-power reactors if they were under NRC regulation. DOE experience requirements are generally the same or greater than NRC guidelines except for some specific evolutions required as part of nuclear power plant experience (e.g., 2 months at >20% power, etc.). Where differences in requirements do exist, those differences resulted from an assessment of the similarities and differences of the DOE nuclear facilities as compared to a commercial reactors or production facilities.

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INTRODUCTION

This report provides a comparison of the similarities and differences between Department of Energy (DOE) selection, qualification, and training requirements for personnel at DOE reactor and non-reactor nuclear facilities to similar Nuclear Regulatory Commission (NRC) requirements and guidance for personnel at NRC-regulated nuclear power reactors, non-power reactors, and production facilities. When developing selection, training, and qualification requirements, DOE related Category A reactors to commercial power reactors, Category B reactors to non-power reactors, and non-reactor nuclear facilities to production facilities. DOE Category A and Category B reactors would be considered non-power reactors if they were under NRC regulation (as defined in ANSI/ANS 15.4-1988, Selection and Training of Personnel for Research Reactors). The comparison between DOE and NRC requirements shows that DOE minimum education and training requirements parallel, and in many cases exceed, NRC regulatory requirements and guidelines.

Section 1 of this report summarizes the relationship between DOE requirements for Category A and Category B reactors and NRC requirements, policy, and guidelines for commercial nuclear power reactors and non-power reactors. The areas compared include training program standards and content, systematic approach to training, simulators, engineering expertise on shift, minimum staffing, overtime, operator proficiency, and medical examinations.

Section 2 illustrates a position-by-position comparison of NRC requirements and guidance controlling personnel selection, qualification, and training at commercial nuclear power reactors to DOE requirements for Category A reactor personnel as issued in 1991 in DOE Order 5480.20, "Personnel Selection, Qualification, Training and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities." The comparison also includes the current DOE requirements contained in DOE Order 5480.20A, "Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities."

Section 3 illustrates a position-by-position comparison of NRC requirements and guidance controlling personnel selection, qualification, and training at NRC licensed non-power reactor facilities (test and research reactors) to the requirements for Category B reactor personnel issued in 1991 in DOE Order 5480.20. The comparison also includes the current DOE requirements contained in DOE Order 5480.20A.

Section 4 is a narrative comparison of NRC requirements and guidance controlling personnel selection, qualification, and training at NRC licensed production facilities to the DOE requirements for non-reactor nuclear facility personnel issued in 1991 in DOE Order 5480.20. The comparison also includes the current DOE requirements contained in DOE Order 5480.20A.

BACKGROUND

The Department of Energy incorporated improvements and regulatory requirements into the selection, qualification, and training of DOE Category A and B reactor and non-reactor nuclear facility operating personnel with the issuance of DOE Order 5480.20. DOE Order 5480.20 encompasses the requirements (education, experience, examination and certification, program frequency, requalification, etc.) that are contained in accepted industry standards for commercial power reactors, non-power reactors, and production facilities, and combines and updates requirements previously contained in DOE Order 5480.5, Safety of Nuclear Facilities, and DOE Order 5480.6, Safety of DOE-Owned Nuclear Reactors, into a single training directive.

DOE Order 5480.20 was revised to reflect the Department's experience with implementation of the Order over the past three years. DOE Order 5480.20A clarifies and enhances the requirements set forth in DOE Order 5480.20 and requires that a Systematic Approach to Training (SAT) be used to develop and maintain operations, maintenance, and technical staff personnel training programs. Other differences between these Orders are minor, and specific differences can be gleaned from this comparative analysis.

DOE established a formal training accreditation program with the issuance of DOE Order 5480.18B, Nuclear Facility Training Accreditation Program. DOE Order 5480.18B requires selected DOE nuclear facilities to have accredited training programs. The purpose of the accreditation program is to improve the Department's training policies and programs and enhance the quality, content, and consistency of these programs. This program is modeled directly after the commercial industry program endorsed by the NRC.

Title 10 Code of Federal Regulations Part 50, Domestic Licensing of Production and Utilization Facilities and Part 55, Operators' Licenses, establishes NRC requirements for commercial nuclear power and non-power reactors. All other NRC generated or endorsed documents such as Regulatory Guides, American National Standards, NUREGs, etc., fall under the category of guidance. Specific applicability of NRC requirements and guidance is detailed in Sections 1 through 4.

The NRC has minimal requirements for the training and qualification of personnel at production facilities. Specific information is included in section 4 of this comparison regarding NRC requirements. The following rules apply to production facilities:

- Title 10, Code of Federal Regulations, Part 19, "Notices, Instructions, and Reports to Workers; Inspections."

- Title 10, Code of Federal Regulations, Part 50, "Domestic Licensing of Production and Utilization Facilities."

- Title 10, Code of Federal Regulations, Part 70, "Domestic Licensing of Special Nuclear Materials."

- Title 10, Code of Federal Regulations, Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste."

- Nuclear Regulatory Commission Division 3 Regulatory Guides, "Fuels and Materials," contain additional guidance for licensed commercial nuclear facilities. The most detailed guidance is contained in Regulatory Guide 3.25, Standard Format and Content of Safety Analysis Reports for Uranium Enrichment Facilities, and Regulatory Guide 3.26, Standard Format and Content of Safety Analysis Reports for Fuel Reprocessing Plants.

SECTION 1

SUMMARY OF SAFETY-RELATED ISSUES

SUMMARY OF SAFETY-RELATED ISSUES

A. TRAINING PROGRAM STANDARDS

1. DOE Category A Reactors/NRC-Regulated Power Reactors

a. NRC Guidance

Nuclear Regulatory Commission (NRC) Regulatory Guide 1.8, Rev. 2 (April 1987), Qualification and Training of Personnel for Nuclear Power Plants, endorses parts of two standards for qualification and training of personnel at commercial nuclear power plants. ANSI/ANS 3.1-1981, American National Standard for Selection, Qualification and Training of Personnel for Nuclear Power Plants, is the standard for shift supervisors, senior reactor operators, reactor operators, shift technical advisors, and radiation protection group leaders. ANSI N18.1-1971, American National Standard for Selection and Training of Nuclear Power Plant Personnel, is endorsed for all other positions; however, ANSI N18.1-1971 does not list all positions contained in ANSI/ANS 3.1-1981. Because of the selective endorsement of ANSI/ANS 3.1-1981, several positions at commercial nuclear power plants are not covered by a standard endorsed by the NRC. The positions omitted are: training managers, quality assurance group leaders, preoperational test personnel, startup test personnel, training coordinators, training instructors, and independent review personnel. Quality assurance personnel are addressed in Regulatory Guide 1.33, Rev. 2, Quality Assurance Program Requirements (Operation), which references ANSI N18.1-1971. Regulatory Guide 1.58, Rev. 1, Qualification of Nuclear Power Plant Inspection, Examination and Testing Personnel, references ANSI/ASME NQA-1-1979, Quality Assurance Program Requirements for Nuclear Facilities, and has been used by the commercial nuclear industry to qualify test personnel and preoperational test personnel.

b. Past DOE Requirements

DOE Order 5480.20, Personnel Selection, Qualification, Training and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities, bases education and experience requirements (see Section 2) on ANSI/ANS 3.1-1981. All positions are addressed with the exception of quality assurance group leader (also not addressed by the NRC). Quality assurance personnel were not addressed

because qualifications of quality organizations are addressed in 10CFR830.120, Quality Assurance Requirements and ANSI/ASME NQA-1-1986, Quality Assurance Program Requirements for Nuclear Facilities.

ANSI/ANS 3.1-1981 and ANSI/ANS 3.1-1987, American National Standard for Selection, Qualification and Training of Personnel for Nuclear Power Plants, are used as the basis for training requirements related to general selection and qualification, general employee training, management and supervisory training, initial and continuing training, training process, and subcontractor training. Training content requirements (see Section 1.C) for reactor operators and senior reactor operators are based on Title 10, Code of Federal Regulations, Part 55 (10CFR55), Operators' Licenses.

c. Current DOE Requirements

DOE Order 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Facilities, is based on the same training program standards and regulations as DOE Order 5480.20.

2. DOE Category B Reactors/NRC-Regulated Non-power Reactors

a. NRC Guidance

The NRC has not written a Regulatory Guide which identifies a specific standard for the qualification and training of personnel at non-power reactor facilities. On July 7, 1994, the NRC published a notice in the federal register (59 FR 34871) that establishes NUREG 1478, Non-Power Reactor Operator Licensing Examiner Standards, as the document which provides policy and guidelines for NRC examiners. Section ES-202N, Eligibility Requirements and Guidelines for Applicants at Non-Power Reactors, uses the guidance contained in ANSI/ANS 15.4-1988, Selection and Training of Personnel for Research Reactors, as the basis for education, experience, certification, and training requirements that must be met before a senior reactor operator or reactor operator may take the NRC licensing examination. ANSI/ANS 15.4-1988 addresses the positions of plant manager, reactor or shift supervisor, senior reactor operator, reactor operator, and technicians (encompassing maintenance personnel). The NRC standard is only concerned with the licensing of senior reactor operators and reactor operators and does not specifically address other positions at research reactors.

b. Past DOE Requirements

DOE Order 5480.20 is based on the standards contained in ANSI/ANS 15.4-1988, Selection and Training of Personnel for Research Reactors. In addition to addressing all positions identified by ANSI/ANS 15.4-1988, DOE Order 5480.20 addresses technical support personnel.

c. Current DOE Requirements

DOE Order 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, is based on the same training program standards and regulations as DOE Order 5480.20.

B. SYSTEMATIC APPROACH TO TRAINING

1. DOE Category A Reactors/NRC-Regulated Power Reactors

a. NRC Guidance

On March 20, 1985 the NRC issued a "Policy Statement on Training and Qualification of Nuclear Power Plant Personnel" (50 FR 11147) that acknowledged the commercial nuclear power industry commitment to accredit their training programs. The NRC policy statement endorsed the training accreditation program managed by the Institute of Nuclear Power Operations (INPO) because it encompasses a systematic approach to training (SAT). The NRC delineats the elements of a systematic approach to training for the development of senior reactor operator and reactor operator training programs. The NRC recognizes the incorporation of these elements by directions provided in 10CFR55, Sections 55.4, 55.31(a), and 55.59(a)(2)(iii) and (c).

b. Past DOE Requirements

On November 2, 1989, DOE issued DOE Order 5480.18, Accreditation of Performance-Based Training for Category A Reactors and Nuclear Facilities. This Order requires performance-based training for operations, maintenance, and technical support personnel. The DOE training accreditation program is modeled after the INPO accreditation program, and contains content and process improvements which are based on the

experience gained by INPO. The program applies to Category A reactors and high-hazard and selected moderate-hazard non-reactor nuclear facilities. The Order was revised July 19, 1991 and reissued as DOE Order 5480.18A. This revision was editorial in nature and did not change accreditation requirements.

DOE Order 5480.20 recommends that a systematic approach to training, such as performance-based training, be used for operations, maintenance, and technical staff training programs at all DOE nuclear facilities.

c. Current DOE Requirements

DOE Order 5480.18A was revised and renamed DOE Order 5480.18B, Nuclear Facility Training Accreditation Program, on August 31, 1994. DOE Order 5480.18B applies to selected nuclear facilities and endorses the systematic approach to training. There are currently no Category A reactor facilities identified as requiring accreditation of their training programs.

DOE Order 5480.20A requires that a systematic approach to training be used for developing and implementing training programs for operations, maintenance, and technical staff positions at all DOE nuclear facilities. A graded approach to training is suggested based on nuclear facility hazard category and nuclear safety-related risk associated with operations.

2. DOE Category B Reactors/NRC-Regulated Non-power Reactors

a. NRC Guidance

10CFR55, Section 55.59(c)(7) requires that non-power reactor licensed operator requalification programs generally conform with the requirements specified for commercial power reactors. 10CFR55 delineats SAT in 10CFR55, Sections 55.4, 55.31(a), and 55.59(a)(2)(iii) and (c), but does not specifically address a systematic approach to training for non-power reactors.

b. Past DOE Requirements

DOE Order 5480.18A does not address performance-based training for DOE Category B reactors.

DOE Order 5480.20 recommends that a systematic approach to training, such as performance-based training, be used to design and develop training and qualification programs for operations, maintenance, and technical staff personnel at DOE Category B reactors.

c. Current DOE Requirements

DOE Order 5480.18B does not require the use of a systematic approach to training for DOE Category B reactors.

DOE Order 5480.20A requires that a systematic approach to training be used for developing and implementing training programs for operations, maintenance, and technical staff positions at all DOE nuclear facilities. A graded approach to training is suggested based on nuclear facility hazard category and nuclear safety-related risk associated with operations.

C. TRAINING PROGRAM CONTENT

1. DOE Category A Reactors/NRC-Regulated Power Reactors

a. NRC Requirements

10CFR55 prescribes the content of written examinations, operating tests, and control manipulations which must be performed on an annual and biennial basis for senior reactor operators and reactor operators licensed by the NRC. Additional guidance is provided to NRC licensed operator examiners in NUREG 1021, Rev. 7, Operator Licensing Examiner Standards.

b. Past DOE Requirements

DOE Order 5480.20 incorporates the requirements to provide training and examination in the areas specified in 10CFR55 and requires that each Category A reactor operating contractor develop a list which contains specific control manipulation training required annually and biennially as identified by a job analysis. In addition, the 10CFR55 requirement for each reactor operator and senior reactor operator to perform a minimum of five significant reactivity control manipulations for initial qualification is included in the Order.

c. Current DOE Requirements

DOE Order 5480.20A training program content is based on the same requirements as DOE Order 5480.20.

2. DOE Category B Reactors/NRC-Regulated Non-power Reactors

a. NRC Requirements

10CFR55 prescribes the content of written examinations, operating tests, and control manipulations which must be performed on an annual and biennial basis for senior reactor operators and reactor operators licensed by the NRC at commercial nuclear power plants. 10CFR55 states that non-power reactors need to generally conform to the licensing requirements for commercial nuclear power plants. NRC licensing of reactor operators and senior reactor operators at non-power reactors is currently based on the guidance provided by NUREG 1478. This NUREG states that training be adequate to ensure the safe operation of the facility, include the topics identified in Section 5.3 and 5.4 of ANSI/ANS 15.4-1988, include operation of the reactor and its systems under the supervision of licensed operators and senior operators, and include the manipulation of the controls of the reactor during 5 significant changes in reactivity or power level.

b. Past DOE Requirements

DOE Order 5480.20 incorporates training and examination requirements from 10CFR55 that are considered applicable to Category B reactors, and fully incorporates the guidance contained in ANSI/ANS 15.4-1988. The Order also requires that each Category B reactor operating contractor develop and approve a list which contains specific control manipulation training required for initial qualification and on a biennial basis. The Order does not specifically require manipulation of the controls of the reactor during 5 significant changes in reactivity or power level. At the time of the issuance of the Order, the NRC used ANS/ANSI 15.4-1977 and NUREG-1021 as the standards for non-power reactors. These standards did not require manipulation of the controls of the reactor during 5 significant reactivity changes or power level. DOE Order 5480.20 suggests that the list of manipulations be derived from an analysis of the position and include manipulations in any combination of reactor startups, shutdowns, or significant reactivity changes.

c. Current DOE Requirements

DOE Order 5480.20A includes a requirement for the manipulation of the controls of the reactor during 5 significant changes in reactivity or power level. All other DOE Order 5480.20A training program content requirements are based on the same requirements as DOE Order 5480.20.

D. USE OF SIMULATORS

1. DOE Category A Reactors/NRC-Regulated Power Reactors

a. NRC Requirements

10CFR55 requires commercial nuclear power plants to have a simulation facility. A simulation facility, as defined, can be (1) the plant, (2) a plant-referenced simulator, or (3) another simulation device or combination thereof. If a plant-referenced simulator is used, the utility must submit a simulator certification to the NRC. A simulator certification certifies that the simulator meets the requirements of ANSI/ANS 3.5-1985, Nuclear Power Plant Simulators for Use in Operator Training, as modified by Regulatory Guide 1.149 of 4-87, Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations. Otherwise, a utility must submit a plan for a simulation facility acceptable to the NRC for the conduct of operating tests. Licensed non-power reactors are exempt from submitting a plan or having a plant referenced simulator or simulator device.

b. Past DOE Requirements

DOE Order 5480.20 requires DOE production reactors to have a full-scope simulator that meets the requirements contained in ANSI/ANS 3.5-1985, as modified by Regulatory Guide 1.149 of 4-87. DOE Category A test and research reactors are required to evaluate their need for a full-scope or part-task simulator on the basis of analyses conducted by the operating contractor. These analyses are then used by the DOE line program organization in determining and approving full-scope or part-task simulators for Category A test and research reactors.

c. Current DOE Requirements

DOE Order 5480.20A simulator requirements are the same as those of DOE Order 5480.20.

2. DOE Category B Reactors/NRC-Regulated Non-power Reactors

a. NRC Requirements

The NRC does not currently require a plant reference simulator or simulator device for non-power reactors.

b. Past DOE Requirements

DOE Order 5480.20 did not require simulators for Category B reactors.

c. Current DOE Requirements

DOE Order 5480.20A does not require simulators for Category B reactors.

E. ENGINEERING EXPERTISE ON SHIFT

1. DOE Category A Reactors/NRC-Regulated Power Reactors

a. NRC Guidance

On October 28, 1985 the NRC issued a "Policy Statement on Engineering Expertise on Shift" (50 FR 43621) that provided two options for meeting nuclear power plant staffing requirements to have a Shift Technical Advisor (STA) available to each shift. One option combines the functions of the STA with one of the on-shift senior reactor operators if specific STA training and education requirements are met. The other option allows for continued use of an independent STA. On August 15, 1989 the NRC issued a "Policy Statement on Education for Senior Reactor Operators and Shift Supervisors at Nuclear Plants" that encourages utilities to continue their efforts to sustain and increase, where appropriate, the professionalism of reactor operator, senior reactor operator, and shift supervisor positions.

b. Past DOE Requirements

DOE Order 5480.20 contains requirements for "engineering expertise on shift" that are identical to the guidance provided by the NRC for commercial nuclear power plants.

c. Current DOE Requirements

DOE Order 5480.20A engineering expertise on shift requirements are the same as those of DOE Order 5480.20.

2. DOE Category B Reactors/NRC-Regulated Non-power Reactors

a. NRC Requirements

The NRC does not currently require engineering expertise on shift for non-power reactors.

b. Past DOE Requirements

DOE Order 5480.20 does not require engineering expertise on shift for Category B reactors.

c. Current DOE Requirements

DOE Order 5480.20A does not require engineering expertise on shift for Category B reactors.

F. FACILITY STAFFING REQUIREMENTS

1. DOE Category A Reactors/NRC-Regulated Power Reactors

a. NRC Requirements

Facility staffing for commercial nuclear power plants is controlled by Technical Specifications which are based on Safety Analysis Reports. Requirements and tables depicting minimum control room and facility staffing by reactor operators and senior reactor operators are contained in Title 10, Code of Federal Regulations, Part 50 (10CFR50), Domestic Licensing of Production and Utilization Facilities. Two senior reactor operators and two reactor operators are required to be on shift at a single-unit commercial nuclear power plant. A senior reactor operator is required to be in the control room and an additional senior reactor operator or reactor operator is required to be at the controls whenever the plant is in an operational mode other than cold shutdown or refueling. Either a senior reactor operator or reactor operator is required to be at the controls at all times during facility operations.

b. Past DOE Requirements

DOE Order 5480.20 contains requirements for control room and facility staffing. Because of the wide variation of facility needs, specific overall facility staffing levels have not been prescribed. However, overall facility staffing is required by the Order to be based on the Safety Analysis Report and approved Technical Specifications. Minimum control room staffing for Category A reactors is identical to NRC requirements for commercial nuclear plants. In addition, at DOE Category A reactors, specific call lists are required and the provisions of Regulatory Guide 1.114, Rev. 2, May 1989, Guidance to Operators at the Controls and Senior Operators in the Control Room of a Nuclear Power Unit, apply.

c. Current DOE Requirements

DOE Order 5480.20A does not address staffing requirements. Staffing requirements are contained in DOE Order 5480.22, Technical Safety Requirements, and DOE Order 5480.23, Nuclear Safety Analysis Reports. The combination of the requirements in these orders are comparable to the requirements previously contained in DOE Order 5480.20.

2. DOE Category B Reactors/NRC-Regulated Non-power Reactors

a. NRC Requirements

Facility staffing for commercial non-power reactors is controlled by Technical Specifications which are based on Safety Analysis Reports. Requirements for minimum control room and facility staffing by licensed reactor operators and senior reactor operators are identified in 10CFR50. A senior reactor operator is required to be present at the facility or readily available on call at all times during operation and must be present at the facility during initial startup and approach to power, recovery from an unplanned or unscheduled shutdown or significant reduction in power, and refueling. A reactor operator must be present at the controls at all times during operation of the facility.

b. Past DOE Requirements

DOE Order 5480.20 contains requirements for control room and facility staffing. A senior reactor operator is required to be in the control room during startup and approach to power, recovery from an unplanned or unscheduled shutdown or significant reduction in power, or as otherwise prescribed by the Technical Specifications.

A reactor operator must be present at the controls at all times during the operation of the facility. These requirements exceed NRC requirements for licensed non-power reactors by explicitly requiring the senior reactor operator to be in the control room during specific evolutions.

c. Current DOE Requirements

DOE Order 5480.20A does not address staffing requirements. Staffing requirements are contained in DOE Order 5480.22, Technical Safety Requirements, and DOE Order 5480.23, Nuclear Safety Analysis Reports. The combination of the requirements in these orders are comparable to the requirements previously contained in DOE Order 5480.20.

G. LIMITATIONS FOR OVERTIME WORKED

1. DOE Category A Reactors/NRC-Regulated Power Reactors

a. NRC Guidance

On June 1, 1982 the NRC issued a "Policy on Factors Causing Fatigue of Operating Personnel at Nuclear Reactors" (47 FR 23836), which established working hour limitations. This policy is consistent with ANSI/ANS 3.2-1982, Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants, with the following exceptions:

(1) ANSI/ANS 3.2-1982 does not specifically state that an individual should not be allowed to work more than 16 hours in a 24 hour period, but implies that the 16 hours are within a 24 hour period;

(2) ANSI/ANS 3.2-1982 does not state that a break of at least 8 hours be allowed between work periods, including shift turnover time; however, other limitations force a break of at least 8 hours;

(3) 47 FR 23836 does not state that an individual should not work more than 14 days without two consecutive days off; and

(4) 47 FR 23836 does not state that if a person is to work in excess of 12 continuous hours, his or her duties should be carefully selected.

NRC Generic Letter 82-16 (dated June 15, 1982), Subject; Nuclear Power Plant Staff Working Hours, contains NRC policy on overtime. This policy is consistent with 47 FR 23836.

b. Past DOE Requirements

DOE Order 5480.20 includes the requirements contained in ANSI/ANS 3.2-1982, but does not include the requirement that an individual should not be allowed to work more than 16 hours in a 24 hour period.

c. Current DOE Requirements

DOE Order 5480.20A does not address overtime limitations. Overtime requirements are addressed in DOE Order 5480.22, Technical Safety Requirements. DOE Order 5480.22 suggests that administrative controls include the maximum working hours and maximum number of consecutive days on duty, but does not specify these hours or days.

2. DOE Category B Reactors/NRC-Regulated Non-power Reactors

a. NRC Guidance

On June 1, 1982 the NRC issued a "Policy on Factors Causing Fatigue of Operating Personnel at Nuclear Reactors" (47 FR 23836), which established working hour limitations. Although this policy statement was written for nuclear power plants, the same general provisions are applied and practiced at NRC-regulated non-power reactors.

b. Past DOE Requirements

DOE Order 5480.20 includes the requirements contained in ANSI/ANS 3.2-1982, but does not identify the requirement that an individual should not be allowed to work more than 16 hours in a 24 hour period.

c. Current DOE Requirements

DOE Order 5480.20A does not address overtime limitations. Overtime requirements are addressed in DOE Order 5480.22, Technical Safety Requirements. DOE Order 5480.22 suggests that administrative controls include the maximum working hours and maximum number of consecutive days on duty, but does not specify the hours or days.

H. PROFICIENCY REQUIREMENTS

1. DOE Category A Reactors/NRC-Regulated Power Reactors

a. NRC Requirements

Licensed reactor operators and senior reactor operators at commercial nuclear power plants must actively perform duties authorized by the license in order to maintain the license current. To maintain active status (proficiency), 10CFR55 requires that the

licensee must actively perform the functions of a reactor operator or senior reactor operator on a minimum of seven 8-hour or five 12-hour shifts per calendar quarter.

b. Past DOE Requirements

DOE Order 5480.20 contains requirements for Category A reactor operators and senior reactor operators to perform certification duties on five 8-hour shifts or three 12-hour shifts per calendar quarter. DOE requirements for Category A production, test, and research reactors differ from those required by the NRC because of the large difference in complexity of these reactors as compared to commercial nuclear power plants.

c. Current DOE Requirements

DOE Order 5480.20A contains the same proficiency requirements as DOE Order 5480.20 with the addition of the stipulation that proficiency can be maintained by performing certification duties on nine 4-hour shifts. This provision has been included to allow for 4-hour shift schedules.

2. DOE Category B Reactors/NRC-Regulated Non-power Reactors

a. NRC Requirements

Licensed operators and senior operators at non-power reactors must actively perform duties authorized by the license in order to maintain the license current. To maintain active status (proficiency), 10CFR55 requires that the licensee must actively perform the functions of a reactor operator or senior reactor operator for a minimum of four hours per calendar quarter.

b. Past DOE Requirements

DOE Order 5480.20 contains requirements for DOE Category B facility senior reactor operators and reactor operators to perform duties associated with certification for a minimum of four hours per calendar quarter.

c. Current DOE Requirements

DOE Order 5480.20A proficiency requirements are the same as those of DOE Order 5480.20.

I. MEDICAL EXAMINATIONS

1. DOE Category A Reactors/NRC-Regulated Power Reactors

a. NRC Requirements

10CFR55 requires that a medical examination be conducted every two years for licensed reactor operators and senior reactor operators. The NRC issued Regulatory Guide 1.134, Rev. 2, Medical Evaluation of Licensed Personnel for Nuclear Plants, in April 1987 to provide additional guidance to licensees for medical certification of operators at commercial nuclear power plants. Regulatory Guide 1.134 endorses the requirements contained in ANSI/ANS 3.4-1983, Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants, as the standard for medical qualifications of license applicants.

b. Past DOE Requirements

DOE Order 5480.20 requires that medical examinations be given to prospective employees and a reexamination be given every two years to certified operators and supervisors at DOE Category A reactors. The Order specifies that the examination be conducted using the requirements contained in ANSI/ANS 3.4-1983 as the standard for medical qualifications of personnel in the operating organization. In addition, DOE Order 5480.20 requires certified operators and supervisors to be cleared by medical examination prior to returning to work following any serious illness or injury which keeps the person from performing their duties for a period of one month.

Note: ANSI/ANS 3.4-1983 contains only editorial changes from ANSI/ANS N546-1976.

c. Current DOE Requirements

DOE Order 5480.20A changed the requirement for medical examinations for prospective employees to initial examinations for certified operator and certified supervisor candidates, and added a stipulation that medical examinations can be performed by a physician's assistant providing that the results of the examination are reviewed and approved by a licensed physician. The remainder of the medical requirements remained the same as those stipulated in DOE Order 5480.20.

2. DOE Category B Reactors/NRC-Regulated Non-power Reactors

a. NRC Guidance

The NRC has not written a Regulatory Guide which identifies a specific standard for medical examinations of personnel at non-power reactor plants. NUREG 1478 (Revision 0) requires that NRC Form 396, Certification of Medical Examination by Facility Licensee, be completed and submitted before a senior reactor operator or reactor operator be allowed to take the NRC licensing examination. NRC Form 396 includes a statement that the examining physician must sign the form, verifying that the physician followed the guidance in ANS 3.4-1983 or ANSI/ANS 15.4-1988.

b. Past DOE Requirements

DOE Order 5480.20 requires medical examinations at Category B reactors in accordance with ANSI/ANS 15.4-1988. This standard contains specific requirements for medical examinations.

c. Current DOE Requirements

DOE Order 5480.20A changed the requirement for medical examinations for prospective employees to initial examinations for certified reactor operator and certified senior reactor operator candidates, and added a stipulation that medical examinations can be performed by a physician's assistant providing that the results of the examination are reviewed and approved by a licensed physician. The remainder of the medical requirements remained the same as those stipulated in DOE 5480.20.

SECTION 2

POSITION-BY-POSITION COMPARISON OF DOE CATEGORY A REACTORS

AND

NRC-LICENSED NUCLEAR POWER REACTORS

PLANT MANAGER

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20A
EDUCATION	PM or designated alternate Baccalaureate in engineering or scientific field generally associated with power production	Bachelor Degree in engineering or related science	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20
EXPERIENCE	10 yrs pwr plant - 3 yrs nuclear pwr 4 yrs of remaining 7 may be fulfilled by academic training in engineering or scientific field If alternate meets nuclear power experience and training requirement, PM need have only 1 yr nuclear pwr plant	6 yrs pwr plant - 3 yrs nuclear pwr -2 months >20% pwr -routine refueling outage (1-2 months) -initial startup or post refueling outage testing (During participation in management activities) - 4 yrs supervisory or management	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exception: Does not require specific activities listed under nuclear experience requirements Same as N18.1 - 1971 Addition: Exceeds the nuclear power plant and supervisory or management experience requirement	Same as DOE 5480.20

PLANT MANAGER (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	Same as SRO except need not take license exam If PM alternate meets experience and SRO examination requirements, PM requirements may be reduced such that only 1 year of the 10 years experience needs to be nuclear experience and need not be eligable for SRO examination General employee training	Training based on job task analysis -Hold SRO license or -Have held SRO license for similar unit or -Have been certified at the plant or an appropriate simulator Training for managers and supervisors General employee training	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Additions: Probabilistic Risk Assessment training Exception: PM need not meet SRO requirement if they have an assistant who holds an SRO certification Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NONE	Initial PM must have 6 months onsite prior to preoperational test program	Endorses N18.1 - 1971	Exceeds N18.1 - 1971 Must be onsite 6 months	Same as DOE 5480.20

OPERATIONS MANAGER

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	Requirement is not specified	Bachelor Degree in engineering or related science	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20
EXPERIENCE	8 yrs pwr plant - 3 yrs nuclear pwr 2 yrs of remaining 5 may be fulfilled by academic or related technical training	4 yrs pwr plant - 3 yrs nuclear pwr -2 months >20% pwr -routine refueling outage (1-2 months) -initial startup or post refueling outage testing (During participation in management activities)	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exception: Does not require specific activities listed under nuclear experience requirements Requires less power plant experience than N18.1 - 1971, but requires a Bachelor degree.	Same as DOE 5480.20

OPERATIONS MANAGER (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	Hold an SRO license General employee training	Training based on job task analysis Obtain and hold an SRO license Training for managers and supervisors General employee training	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Addition: Probabilistic Risk Assessment training Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NONE	Initial OM must have 6 months onsite prior to preoperational test program	Endorses N18.1 - 1971	Must be onsite 6 months Exceeds N18.1 - 1971	Sane as DOE 5480.20

MAINTENANCE MANAGER

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20
EDUCATION	NDT familiarity, craft knowledge, and an understanding of electrical, pressure vessel, and piping codes	Bachelor Degree in engineering or related science NDT familiarity, craft knowledge, and an understanding of electrical, pressure vessel, and piping codes and standards	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20
EXPERIENCE	7 yrs pwr plant or applicable industrial - 1 yr nuclear power 2 yrs of remaining 6 may be fulfilled by academic or related technical training	4 yrs pwr plant - 2 yrs nuclear pwr -1 month >20% pwr -routine refueling outage (1-2 months) (During participation in management activities)	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exception: Does not require specific activities listed under nuclear experience requirements Requires less power plant experience than N18.1 - 1971, but requires a Bachelor degree. Requires more nuclear experience than N18.1-1971.	Same as DOE 5480.20

MAINTENANCE MANAGER (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	A suitable training program to prepare for assignments and meet the requirements of the facility licensee If not already qualified by experience and academic training, shall be qualified by programs in related technical training; responsible assignments at operating reactors or simulators; or participation in design, construction, or startup activities General employee training	Training based on job task analysis Training for managers and Supervisors General employee training	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NONE	Initial Maintenance Manager must have 6 months onsite prior to preoperational test program	Endorses N18.1 - 1971	Must be onsite 6 months Exceeds N18.1 - 1971	Same as DOE 5480.20

TECHNICAL MANAGER

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	Requirement is not specified	Bachelor Degree in engineering or related science	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20
EXPERIENCE	8 yrs in responsible positions - 1 yr nuclear power 4 yrs of remaining 7 may be fulfilled by academic or technical training	4 yrs responsible position related to power generation -3 yrs nuclear power -1 month >20% power -routine refueling outage (1-2 months) -initial plant or post refueling outage startup testing (During participation in technical or operations activities)	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exception: Does not require specific activities listed under nuclear experience requirements Requires less power plant experience than N18.1 - 1971, but requires a Bachelor degree. Requires more nuclear experience than N18.1-1971.	Same as DOE 5480.20

TECHNICAL MANAGER (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	A suitable training program to prepare for assignments and meet the requirements of the facility licensee If not already qualified by experience and academic training, shall be qualified by programs in related technical training; responsible assignments at operating reactors or simulators; or participation in design, construction, or startup activities General employee training	Training based on job task analysis -Hold SRO license or -Have held SRO license at a similar unit or -Have been certified at the plant or at an appropriate simulator Training for managers and Supervisors General employee training	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Addition: Probabilistic Risk Assessment training Exceeds N18.1 - 1971	Same as DOE 5480.20 Exception: Does not require the TM to hold or have held an SRO certification
SPECIAL REQMTS	NONE	Initial Technical Manager must have 6 months onsite prior to preoperational test program	Endorses N18.1 - 1971	Must be onsite 6 months Exceeds N18.1 - 1971	Same as DOE 5480.20

TRAINING MANAGER

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	NOT ADDRESSED BY THIS STANDARD	Bachelor Degree including courses in education and technical subjects	Endorses N18.1-1971	Same as ANS 3.1 - 1981	Same as DOE 5480.20
EXPERIENCE	NOT ADDRESSED BY THIS STANDARD	4 yrs professional level - 2 yrs nuclear pwr -1 month >20% pwr -requalification written and oral exam period (1-2 months) (During participation in operations or training activities)	Endorses N18.1-1971	Same as ANS 3.1 - 1981 Exception: Does not require specific activities listed under nuclear experience requirements	Same as DOE 5480.20

TRAINING MANAGER (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	NOT ADDRESSED BY THIS STANDARD	Training based on job task analysis Training for managers and supervisors General employee training Training in educational techniques if not included in degree course material	Endorses N18.1-1971	Same as ANS 3.1 - 1981	Same as DOE 5480.20
SPECIAL REQMTS	NOT ADDRESSED BY THIS STANDARD	If the Training Manager does not possess an SRO license, another individual with an SRO license will be responsible to the Training Manager for content and conduct of the licensed operator training program	Endorses N18.1-1971	Same as ANS 3.1 - 1981	Same as DOE 5480.20 Exception: If the Training Manager does not hold or has not held an SRO certification

SHIFT SUPERVISOR

	N18.1-1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	High School diploma or equivalent	High School diploma plus 60 semester hours of college level education in specific subjects If education requirement not met, must have an STA	Endorses ANS 3.1 - 1981 Exception: (RG 1.8-1987) College level education is not required Requires engineering exp-ertise on shift on all shifts regardless of the Shift Supervisors education Provides two options for STA	Same as ANS 3.1 - 1981 plus clarification in RG 1.8 - 1987	Same as DOE 5480.20
EXPERIENCE	4 yrs. power plant -1 yr. nuclear power 2 yrs. of remaining 3 may be fulfilled by academic or related technical training Shall hold an appropriate license at time of initial core loading or appointment to the active position	4 yrs. power plant -2 yrs. nuclear power -6 weeks >20% power -startup from subcritical to 20% power -shutdown from above 20% power to cold and sub-critical -startup preparations following a refueling outage (During participation in reactor operator activities)	Endorses ANS 3.1 - 1981	Same as ANS 3.1 - 1981 Exception: Does not require all of the specific activities listed under nuclear experience requirements.	Same as DOE 5480.20

SHIFT SUPERVISOR (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	10CFR55 consistent with AEC license requirements Related technical training in specific subjects General employee training	Training based on job task analysis Obtain and hold SRO license Licensed supervisor training General employee training	Endorses ANS 3.1 - 1981	Same as ANS 3.1 - 1981 Addition: Probabilistic risk Assessment training	Same as DOE 5480.20
SPECIAL REQMTS	Hold an applicable AEC license	Certification by corporate management for competency prior to NRC licensing	Endorses ANS 3.1 - 1981	Same as ANS 3 - 1981 Exception: Certification by contractor management	Same as DOE 5480.20

SENIOR REACTOR OPERATOR

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	High School diploma or equivalent	High School diploma plus 30 semester hours of college-level education in specific subjects	Endorses ANS 3.1 - 1981 Exception: (RG 1.8-1987) College-level education is not required	Same as ANS 3.1 - 1981 plus clarifications of RG 1.8 - 1987	Same as DOE 5480.20
EXPERIENCE	4 yrs. power plant -1 yr. nuclear power 2 yrs. of remaining 3 may be fulfilled by academic or related technical training Shall hold an appropriate AEC license at the time of initial core loading or appointment to the active position	3 yrs. power plant -2 yrs nuclear power -6 weeks >20% power -normally 1 yr. but not less than 6 months as RO	Endorses ANS 3.1 - 1981 Exceptions: (RG 1.8-1987) 4 yrs. power plant -2 yrs. may be fulfilled by academic or related technical training -2 yrs. nuclear power -6 months of nuclear power must be at the plant for which license is sought If applicant does not have a bachelors degree in engineering or equivalent, should have held an operators license and should have been actively involved in licensed duties for 1 yr.	Same as ANS 3.1 - 1981 plus clarifications of RG 1.8 - 1987	Same as DOE 5480.20

SENIOR REACTOR OPERATOR (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	10CFR55 consistent with AEC license requirements Related technical training in specific subjects General employee training	Training based on job task analysis Obtain and hold SRO license Plant fundamentals; plant systems including classroom and plant observation; operating practice including control room operating experience; and simulator including specific control manipulations Additional training in subjects relating to their duties above that required by RO General employee training	Endorses ANS 3.1 - 1981 Additions: (RG 1.8-1987) Classroom training on use of installed plant systems for control and mitigation of an accident in which the core is severely damaged 3 months as extra SRO on shift in training Control room operating experience to include 5 reactivity changes	Same as ANS 3.1 - 1981 plus clarifications of RG 1.8 - 1987 Additions: Probabilistic Risk Assessment training Subjects for written examination and operational evaluation from 10CFR55 as related to the job analysis Site specific list of control manipulations approved by the Head of the Field Organization Candidates with bachelors degree required to perform all control manipulations that RO would perform Exception: ANS 3.1 - 1981 fundamentals and systems topics not specifically indicated, since 10CFR55 topics are listed under examination and evaluation requirements.	Same as DOE 5480.20
SPECIAL REQMTS	Hold an AEC SRO license	Competency certified by corporate management prior to NRC licensing program	Endorses ANS 3.1 - 1981	Same as ANS 3.1 - 1981 Exception: Certification is by contractor management	Same as DOE 5480.20

QUALIFIED SUPERVISORS

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	High School diploma or equivalent	High School diploma	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981	Same as DOE 5480.20
EXPERIENCE	4 yrs. in the craft or discipline supervised	4 yrs. working experience in the craft or discipline supervised -1 yr. nuclear power plant	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20

QUALIFIED SUPERVISORS (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	Training to properly prepare them for their assignments and to meet the requirements established by the facility licensee	Training based on job task analysis Training for managers and supervisors General employee training Supervisory skills including -Leadership -Interpersonal Communications -Command responsibilities and limits -Motivation of personnel -Problem analysis -Decisional analysis -Administrative requirements	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Addition: Probabilistic Risk Assessment training for supervisors associated with operations Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NONE	If activities could affect the quality of structures, systems, and components important to safety, supervisor required to be on site under supervision for 3 months	Endorses N18.1 - 1971	Must be onsite 3 months Exceeds N18.1 - 1971	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
REACTOR ENGINEERING

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	Bachelor Degree in engineering or the physical sciences	Bachelor Degree in engineering or related science	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981	Same as DOE 5480.20
EXPERIENCE	2 yrs in reactor physics, core measurements, core heat transfer, and core physics testing programs	4 yrs professional level -2 yrs nuclear power plant in reactor physics, core measurements, core heat transfer, and core physics testing programs -initial fueling or refueling outage fuel handling period -initial startup test program or post refueling outage startup test program -power increase from 10% to 100% including stabilization of xenon -rod sequence exchange (BWR only) -2 weeks >20% power	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exception: Does not require specific activities listed under nuclear experience reqmts Exceeds N18.1 - 1971	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
REACTOR ENGINEERING (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	A suitable training program to prepare for assignments and meet the requirements of the facility licensee If not already qualified by experience and related technical or academic training, shall be qualified by programs in related technical training, or by assignments at operating reactors or at vendor facilities General employee training	Training based on job task analysis Training to compensate for deficiencies identified by comparing the individuals experience and knowledge to the task analysis General employee training	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Addition: Probabilistic Risk Assessment training Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NONE	6 months experience onsite	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
INSTRUMENTATION AND CONTROL

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	Requirement is not specified	Associate Degree in engineering or related science	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20
EXPERIENCE	5 yrs in instrumentation and control -6 months nuclear instrumentation and control -2 yrs related technical training 4 yrs may be fulfilled by related technical or academic training	2 yrs in power plant instrumentation and control -1 yr nuclear power -surveillance testing and calibration during initial fueling or refueling -startup preparation testing at the end of initial fueling or refueling -initial fueling or post refueling outage startup testing -1 month >20% power (during participation in instrumentation and control activities) If has a Bachelor Degree, experience will be fulfilled by 6 months onsite and completion of the nuclear power experience requirements	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceptions: Does not require specific activities listed under nuclear experience requirements Requires less job-related experience than N18.1 - 71, but more nuclear experience Does not specifically address Degree fulfilling 6 months experience reqmt	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
INSTRUMENTATION AND CONTROL (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	A suitable training program to prepare for assignments and meet the requirements of the facility licensee If not already qualified by experience and academic training, shall be qualified by programs in related technical training or by assignments at operating reactors or at vendor facilities General employee training	Training based on job task analysis Training to compensate for deficiencies identified by comparing the individuals experience and knowledge to the task analysis General employee training	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Addition: Probabilistic Risk Assessment training Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NONE	6 months experience onsite	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
CHEMISTRY/RADIOCHEMISTRY

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	Requirement is not specified	Bachelor Degree in chemistry or related science	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20
EXPERIENCE	5 yrs chemistry -1 yr radiochemistry -2 yrs related technical training 4 of 5 yrs may be fulfilled by related technical or academic training	2 yrs chemistry -1 yr nuclear power in radiochemistry -3 months in chemistry section -2 months >20% power Completion of chemistry and radiochemistry training program may be equivalent to 6 months nuclear power experience	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exception: Does not require specific activities listed under nuclear experience reqmts Requires less job-related experience than N18.1 - 1971	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
CHEMISTRY/RADIOCHEMISTRY (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	A suitable training program to prepare for assignments and meet the requirements of the facility licensee If not already qualified by experience and academic training, shall be qualified by programs in related technical training, or by assignments at operating reactors or vendor facilities General employee training	Training based on job task analysis Training to compensate for deficiencies identified by comparing the individuals experience and knowledge to the task analysis General employee training	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Addition: Probabilistic Risk Assessment training Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NONE	6 months experience onsite	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
RADIATION PROTECTION

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	Requirement is not specified	Bachelor Degree in a science or engineering subject including formal training in radiation protection	Endorses ANS 3.1 - 1981	Same as ANS 3.1 - 1981	Same as DOE 5480.20
EXPERIENCE	5 yrs radiation protection at a nuclear reactor facility -2 of 5 yrs should be related technical training 4 of 5 yrs may be fulfilled by related technical or academic training	4 yrs applied radiation protection -3 yrs applied radiation protection work dealing with problems similar to those in nuclear power plants preferably in a nuclear power plant -routine refueling outage (1-2 months) -2 months >20% power	Endorses ANS 3.1 - 1981 Exception: (RG 1.8-1987) 3 of 4 yrs in applied radiation protection should be professional-level experience	Same as ANS 3.1 - 1981 and clarifications of RG 1.8 - 1987 Exception: Does not require specific activities listed under nuclear experience reqmts	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
RADIATION PROTECTION (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20
TRAINING	A suitable training program to prepare for assignments and meet the requirements of the facility licensee If not already qualified by experience and related technical or academic training, shall be qualified by programs in related technical training, or by assignments at operating reactors or at vendor facilities General employee training	Training based on job task analysis Training to compensate for deficiencies identified by comparing the individuals experience and knowledge to the task analysis General employee training	Endorses ANS 3.1 - 1981	Same as ANS 3.1 - 1981 Addition: Probabilistic Risk Assessment training	Same as DOE 5480.20
SPECIAL REQMTS	NONE	6 months experience onsite	Same as ANS 3.1 - 1981	Same as ANS 3.1 - 1981	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
QUALITY ASSURANCE

	N18 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	NOT ADDRESSED BY THIS STANDARD	Bachelors Degree in engineering or related science	Endorses N18.1 - 1971	NOT ADDRESSED	Not addressed in this Order. QA is addressed in 10CFR830.120 and NQA-1-1986
EXPERIENCE	NOT ADDRESSED BY THIS STANDARD	4 years quality assurance or equivalent number of years of nuclear power plant experience in a supervisory position, preferably at an operating nuclear power plant or a combination of the two - 1 year shall be nuclear power plant in the implementation of the QA program	Endorses N18.1 - 1971	NOT ADDRESSED	Not addressed in this Order. QA is addressed in 10CFR830.120 and NQA-1-1986

TECHNICAL SUPPORT PERSONNEL
QUALITY ASSURANCE (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	NOT ADDRESSED BY THIS STANDARD	Training to compensate for deficiencies identified by comparing the individual's experience and knowledge to the task analysis General employee training	Endorses N18.1 - 1971	NOT ADDRESSED	Not addressed in this Order. QA is addressed in 10CFR830.120 and NQA-1-1986
SPECIAL REQMTS	NOT ADDRESSED BY THIS STANDARD	NONE	Endorses N18.1 - 1971	NOT ADDRESSED	Not addressed in this Order. QA is addressed in 10CFR830.120 and NQA-1-1986

TECHNICAL SUPPORT PERSONNEL
PREOPERATIONAL TESTING ENGINEER

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	NOT ADDRESSED BY THIS STANDARD	Bachelors Degree in Engineering or related science	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20
EXPERIENCE	NOT ADDRESSED BY THIS STANDARD	1 year power plant	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
PREOPERATIONAL TESTING ENGINEER (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	NOT ADDRESSED BY THIS STANDARD	Training based on job task analysis Training to compensate for deficiencies identified by comparing the individual's experience and knowledge to the task analysis General employee training	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Addition: Probabilistic Risk Assessment training Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NOT ADDRESSED BY THIS STANDARD	Be knowledgeable of the test program administration and the design and operational performance requirements of the system and equipment being tested and its system interaction	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
START-UP TESTING ENGINEER

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQIREMENTS DOE 5480.20A
EDUCATION	NOT ADDRESSED BY THIS STANDARD	Bachelors Degree in Engineering or related science	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20
EXPERIENCE	NOT ADDRESSED BY THIS STANDARD	2 years power plant -1 year nuclear power plant	Endorse N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
START-UP TESTING ENGINEER (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	NOT ADDRESSED BY THIS STANDARD	Training based on job task analysis Training to compensate for deficiencies identified by comparing the individual's experience and knowledge to the task analysis General employee training	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Addition: Probabilistic Risk Assessment training Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NOT ADDRESSED BY THIS STANDARD	Be knowledgeable of the test program administration, the system design and operational requirements, and expected plant operat-ional characteristics during the test	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL
TRAINING COORDINATOR

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	NOT ADDRESSED BY THIS STANDARD	High School diploma	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20 Exception: Training Coordinator is not included in Technical Staff. It is in a separate section, "Training Organization Personnel"
EXPERIENCE	NOT ADDRESSED BY THIS STANDARD	2 years power plant - 6 months onsite	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20 Exception: Training Coordinator is not included in Technical Staff. It is in a separate section, "Training Organization Personnel"

TECHNICAL SUPPORT PERSONNEL
TRAINING COORDINATOR (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	NOT ADDRESSED BY THIS STANDARD	Training based on job task analysis General employee training Training to compensate for deficiencies identified by comparing the individual's experience and knowledge to the task analysis	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20 Exception: Training Coordinator is not included in Technical Staff. It is in a separate section, "Training Organization Personnel"
SPECIAL REQMTS	NOT ADDRESSED BY THIS STANDARD	Person responsible for coordination of the program and for content may be the same, but must meet the higher qualification and be located onsite	Endorses N18.1 - 1971	NONE	Same as DOE 5480.20 Exception: Training Coordinator is not included in Technical Staff. It is in a separate section, "Training Organization Personnel"

TECHNICAL SUPPORT PERSONNEL
TRAINING INSTRUCTOR

	N18 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	NOT ADDRESSED BY THIS STANDARD	High School diploma and Special education consistent with the materials being presented	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exception: Additional special education not specifically required Exceeds N18.1 - 1971	Same as DOE 5480.20 Exception: Training Instructor is not included in Technical Staff. It is in a separate section, "Training Organization Personnel"
EXPERIENCE	NOT ADDRESSED BY THIS STANDARD	Experience consistent with materials being presented	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20 Exception: Training Instructor is not included in Technical Staff. It is in a separate section, "Training Organization Personnel"

TECHNICAL SUPPORT PERSONNEL
TRAINING INSTRUCTOR (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	NOT ADDRESSED BY THIS STANDARD	Training based on job task analysis General employee training	Endorses N18.1 - 1987	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20 Exception: Training Instructor is not included in Technical Staff. It is in a separate section, "Training Organization Personnel"
SPECIAL REQMTS	NOT ADDRESSED BY THIS STANDARD	Instructors who provide simulator training shall: -Hold SRO license or -Have held SRO license for similar unit or -Have been certified at an appropriate simulator Instructors who provide instruction on technical specifications, operating practice, and control manipulations shall have received SRO training Non-licensed instructors may be used in areas where they have specific expertise Shall be certified by the training manager for the material being presented	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exception: Does not specifically allow non-certified instructors to be used in areas where they have specific expertise Exceeds N18.1 - 1971	Same as DOE 5480.20 Exception: Training Instructor is not included in Technical Staff. It is in a separate section, "Training Organization Personnel"

SHIFT TECHNICAL ADVISOR

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	NOT ADDRESSED BY THIS STANDARD	High School diploma plus 60 semester hours college level education in mathematics, reactor physics, chemistry, materials, reactor thermodynamics, fluid mechanics, heat transfer, electrical and reactor control theory	Endorses ANS 3.1 - 1981 Exception: (RG 1.8-1987) Bachelor Degree or equivalent in a scientific or engineering discipline	Same as ANS 3.1 - 1981 plus clarifications of RG 1.8 - 1987	Same as DOE 5480.20
EXPERIENCE	NOT ADDRESSED BY THIS STANDARD	1 yr. nuclear power plant -6 months onsite	Endorses ANS 3.1 - 1981	Same as ANS 3.1 - 1981	Same as DOE 5480.20

SHIFT TECHNICAL ADVISOR (Continued)

	N18.1 -1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	NOT ADDRESSED BY THIS STANDARD	Training based on job task analysis Lectures covering accidents in FSAR and consequences; plant specific thermodynamics/fluid flow, reactor physics, system engineering, transient and accident analysis, nuclear instrumentation, process computer, plant response, and the duties of the STA Performance of selected control manipulations General employee training	Endorses ANS 3.1 - 1981 Addition: (RG 1.8-1987) Training in the response to and analysis of plant transients and accidents and training in the relationship of accident con-ditions to offsite consequences and protective action strategies	Same as ANS 3.1 - 1981 plus RG 1.8 - 1987 clarification Addition: Probabilistic Risk Assessment training	Same as DOE 5480.20
SPECIAL REQMTS	NOT ADDRESSED BY THIS STANDARD	Knowledgeable of control room instruments and controls and be assigned to advise the responsible shift supervisor concerning abnormal plant operating conditions	Endorses ANS 3.1 - 1981	Same as ANS 3.1 - 1981	Same as DOE 5480.20

QUALIFIED OPERATOR

	N18.1 - 1971	ANS 3.1 - 1981 [1]	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20 [1]	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A [1]
EDUCATION	High School diploma or equivalent	High School diploma	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Same as N18.1 - 1971	Same as DOE 5480.20
EXPERIENCE	Posses high degree of manual dexterity and mature judgment Selection interviews and examinations should be used to aid in determining individual ability to progress to high levels of responsibility and to eventual AEC licensing	Operators whose actions could affect the quality of structures, systems, and components important to safety shall have 1 year power plant experience	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20

[1] Qualified (Auxiliary) Operator assumed to be Non-Licensed Operator for comparison purposes

QUALIFIED OPERATOR (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	A suitable training program to properly prepare them for their assignments; and to meet the requirements of the facility licensee General employee training	Training based on job task analysis General employee training -Generic equipment or component design and applications -Specific equipment and system operation and operating requirements -Specific equipment and system operating procedures -Specific equipment and system function during a transient (if applicable) -Relationship of specific equipment and system to safety and technical specification limiting conditions for operation and surveillance requirements (if applicable) -Responsibilities during transients, malfunctions and emergency procedure response -Identification and reporting of equipment or system deficiencies	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Addition: Probabilistic Risk Assessment training Exception: Does not specifically require training on the topics in ANS 3.1 - 1981. However, these topics would normally be identified by a job analysis. Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NONE	NONE	Endorses N18.1 - 1971	NONE	Same as DOE 5480.20

REACTOR OPERATOR

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	High School diploma or equivalent	High School diploma	Endorses ANS 3.1 - 1981	Same as ANS 3.1 - 1981	Same as DOE 5480.20
EXPERIENCE	2 yrs. power plant -1 yr. nuclear power Shall hold an AEC reactor operators license before being accepted for full responsibility in the job	3 yrs. power plant -1 yr. shall be, preferably performing nonlicensed duties at the plant for which NRC license is held -6 months as a nonlicensed operator	Endorses ANS 3.1 - 1981	Same as ANS 3.1 - 1981	Same as DOE 5480.20

REACTOR OPERATOR (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	10CFR55 regulations consistent with AEC license requirement Related technical training in specific subjects General employee training	Obtain and hold operator license Training based on job task analysis Plant fundamental; plant systems including classroom instruction and plant observation; operating practice including control room operating experience; and simulator including specific control manipulations General employee training	Endorses ANS 3.1 - 1981 Additions: (RG 1.8-1987) Classroom training on use of installed plant systems for control and mitigation of an accident in which the core is severely damaged 3 months on shift as an extra RO Manipulation of the controls during a minimum of 5 reactivity changes	Same as ANS 3.1 - 1981 plus clarifications of RG 1.8 - 1987 Additions: Probabilistic Risk Assessment training Subjects for written examinations and operational evaluations for 10CFR55 as related to the job analysis Site specific list of control manipulations approved by the Head of the Field Organization Exception: ANS 3.1 - 1981 fundamentals and systems topics not specifically indicated, since 10CFR55 topics are listed under examination and evaluation requirements.	Same as DOE 5480.20
SPECIAL REQMTS	Hold an AEC RO license	Certification by corporate management for competency prior to NRC licensing	Endorses ANS 3.1 - 1981	Same as ANS 3.1 - 1981 Exception: Certification is by contractor management	Same as DOE 5480.20

TECHNICIAN

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	Requirement is not specified	High School diploma	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20
EXPERIENCE	2 yrs. working experience in their specialty 1 yr. related technical training	3 yrs. working experience in their specialty	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971 Exception: Related technical training not required	Same as DOE 5480.20

TECHNICIAN (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	A suitable training program to properly prepare them for their assignments and to meet the requirements of the facility licensee Trained by on-the-job training; by participation in initial calibration, testing, and equipment acceptance programs; or by related technical training General employee training	Training based on job task analysis Trained by on-the-job training; by participation in initial calibration, testing, and equipment acceptance programs; or by related technical training Training program for jobs that could affect the quality of structures, systems, and components important to safety shall include applicable administrative controls, special complex system and component instruction and demonstrated performance capability General employee training	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exception: Does not specify OJT as the only required type of training Does not allow substitution of related technical training Does not specifically require training on the topics in ANS 3.1 - 1981. Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NONE	Shall have demonstrated their ability to perform assigned tasks and their knowledge of the significance on plant operation	Endorses N18.1 - 1971	NONE	Same as DOE 5480.20

MAINTENANCE PERSONNEL

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	Requirement is not specified	Journeyman Level	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20
EXPERIENCE	3 yrs. in one or more crafts High degree of manual dexterity and ability and should be capable of learning and applying basic skills in maintenance operations	3 yrs. working experience in one of more crafts	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Same as N18.1 - 1971 Exception: High degree of manual dexterity and ability and should be capable of learning and applying basic skills in maintenance operations	Same as DOE 5480.20

MAINTENANCE PERSONNEL (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	A suitable training program to properly prepare them for their assignments and to meet the requirements of the facility licensee Trained by on-the-job training; by participation in initial calibration, testing, and equipment acceptance programs; or by related technical training General employee training	Training based on job task analysis Trained by on-the-job training; by participation in initial calibration, testing, and equipment acceptance programs; or by related technical training Training program for jobs that could affect the quality of structures, systems, and components important to safety shall include applicable administrative controls, special complex system and component instruction and demonstrated performance capability General employee training	Endorse N18.1 - 1971	Same as ANS 3.1 - 1981 Exception: Does not specify OJT as the only required type of training Does not allow substitution of related technical training Does not specifically require training on the topics in ANS 3.1 - 1981. Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NONE	Shall have demonstrated their ability to perform assigned tasks and their knowledge of the significance on plant operation	Endorses N18.1 - 1971	NONE	Same as DOE 5480.20

ENGINEER IN CHARGE

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20 [1]	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A [1]
EDUCATION	Bachelors Degree in Engineering or the Physical Sciences	Bachelor Degree in Engineering or related sciences	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981	Same as DOE 5480.20
EXPERIENCE	3 yrs. professional level in nuclear services, nuclear plant operation, or nuclear engineering and the overall background to determine when to call consultants and contractors for dealing with complex problems beyond the scope of owner-organization expertise	6 yrs. working experience in nuclear engineering, nuclear services, or nuclear plant operation and the overall background to determine when to call consultants and contractors for dealing with complex problems beyond the scope of owner-organization expertise	Endorses N18.1 - 1971	Requires less experience than ANS 3.1 - 1981 and N18.1 - 1971	Same as DOE 5480.20

[1] Engineer in Charge considered to be part of Technical Support Personnel in DOE Order 5480.20 and DOE 5480.20A

ENGINEER IN CHARGE (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	If not already qualified by experience and related technical and academic training, shall be qualified by programs in related technical training, or by assignments at operating reactors or at vendor facilities to meet qualification General employee training	Training based on job task analysis Training for managers and supervisors General employee training	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Addition: Probabilistic Risk Assessment training Exceeds N18.1 - 1971	Same as DOE 5480.20
SPECIAL REQMTS	NONE	Normally an offsite position that does not report to the plant manager	Endorses N18.1 - 1971	NONE	Same as DOE 5480.20

STANDING REVIEW COMMITTEE CHAIRMAN

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20 [1]	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A [1]
EDUCATION	NOT ADDRESSED BY THIS STANDARD	Bachelor Degree in Engineering or related science	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20
EXPERIENCE	NOT ADDRESSED BY THIS STANDARD	6 yrs. professional level managerial experience in the power field	Endorses N18.1 - 1971	Requires less experience than ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20

[1] Standing Review Committee Chairman considered to be part of the Technical Support Personnel in DOE Order 5480.20 and DOE 5480.20A

STANDING REVIEW COMMITTEE CHAIRMAN (Continued)

	N18.1 - 1971	ANS 3.1 - 1981	NRC GUIDANCE RG 1.8 - 1987	PAST DOE MINIMUM REQUIREMENTS DOE ORDER 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
TRAINING	NOT ADDRESSED BY THIS STANDARD	Training based on job task analysis Training for managers and supervisors	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Addition: Probabilistic Risk Assessment training	Same as DOE 5480.20
SPECIAL REQMTS	NOT ADDRESSED BY THIS STANDARD	Nuclear background necessary to determine when to consult others for dealing with complex problems beyond scope of owner-organization expertise	Endorses N18.1 - 1971	Same as ANS 3.1 - 1981 Exceeds N18.1 - 1971	Same as DOE 5480.20

SECTION 3

POSITION-BY-POSITION COMPARISON OF DOE CATEGORY B REACTORS

AND

NRC-LICENSED NON-POWER REACTORS

NOTE

Although ANS 15.4-1988, Selection and Training of Personnel for Research Reactors, is not formally endorsed by an NRC Regulatory Guide, most licensed test and research reactors utilize this standard. NRC licensing of test and research reactor senior reactor operators and reactor operators is currently based on 10CFR55 using the guidance provided by NUREG-1478.

MANAGER LEVEL

	NRC GUIDANCE NUREG-1478/ES-202N Rev. 0 or ANS 15.4-1988	PAST DOE MINIMUM REQUIREMENTS DOE 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	Level 1 Manager -- Not specified Level 2 Manager -- Recognized baccalaureate or higher degree in engineering or science (ANS 15.4-1988)	All Manager level personnel are required to have a Baccalaureate in engineering or related science	Same as DOE 5480.20
EXPERIENCE	Level 1 Manager -- Not specified Level 2 Manager -- 6 years nuclear (ANS 15.4-1988)	All Manager level personnel are required to have the experience indicated in ANS 15.4-1988 for level 2 Managers	Same as DOE 5480.20
TRAINING	Facility-specific training based on comparison of background and abilities with responsibilities and duties. Because of educational and experience requirements, additional formal training may not be required; If the individual is to be certified, must meet the requirements of the certified position (ANS 15.4-1988)	Facility-specific training based on comparison of background and abilities with responsibilities and duties Addition: General employee training Probabilistic Risk Assessment training Training for Managers and Supervisors	Same as DOE 5480.20
SPECIAL REQMTS	Nuclear experience acquired at nuclear power, test, research, or production reactor or critical facility may qualify on a one-to-one time basis; Equivalent education or experience may be substituted for a degree The degree may fulfill 4 years of the six years nuclear experience on a one-for-one time basis (ANS 15.4-1988)	Same as ANS 15.4 - 1988	Same as DOE 5480.20

REACTOR OR SHIFT SUPERVISOR

	NRC GUIDANCE NUREG-1478/ES-202N Rev. 0 or ANS 15.4-1988	PAST DOE MINIMUM REQUIREMENTS DOE 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	ANS 15.4-1988 recommends a High School Diploma or equivalent	Requires a High School Diploma	Same as DOE 5480.20
EXPERIENCE	3 years nuclear (ANS 15.4-1988) Nuclear experience acquired at a nuclear power, test, research, or production reactor or critical facility may qualify on a one-to-one time basis A maximum of two years equivalent full-time academic training may be substituted for two years of the 3 years of nuclear related experience (ANS 15.4-1988)	Same as ANS 15.4-1988	Same as DOE 5480.20
TRAINING	Senior Reactor Operator training and certification (ANS 15.4-1988)	Same as ANS 15.4-1988 Addition: Supervisory skills training	Same as DOE 5480.20

SENIOR REACTOR OPERATOR

	NRC GUIDANCE NUREG-1478/ES-202N Rev. 0 or ANS 15.4 - 1988	PAST DOE MINIMUM REQUIREMENTS DOE 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	ES-202N and ANS 15.4-1988 recommends a High School diploma or equivalent	Requires a High School diploma	Same as DOE 5480.20
EXPERIENCE	3 yrs. nuclear (ES-202N and ANS 15.4 - 1988) Nuclear experience acquired at a nuclear power, test, research, or production reactor or critical facility may qualify on a one-to-one time basis (ANS 15.4-1988) A maximum of two years equivalent full-time academic training may be substituted for two years of the 3 yrs. of nuclear related exper-ience (ES-202N and ANS 15.4 - 1988)	Same as ES-202N and ANS 15.4 - 1988	Same as DOE 5480.20
TRAINING	Reactor operator training Addition: Demonstrate the knowledge and skills commensurate with the additional duties and responsibilities (ANS 15.4 - 1988) Training adequate to ensure safe operation of the facility, and include operation of the reactor and its control systems (ES-202N) SRO Instant Only -- Manipulation of the controls during 5 significant changes in reactivity or power level (ES-202N)	Reactor operator training Addition: Radioactive materials handling; advanced theory and operation; Fuel handling operations; Control Manipulations; Technical specification bases SRO instant is not addressed	Same as DOE 5480.20 Addition: Manipulation of the controls of the reactor during 5 significant reactivity changes

REACTOR OPERATOR

	NRC GUIDANCE NUREG 1478/ES-202N Rev. 0 or ANS 15.4 - 1988	PAST DOE MINIMUM REQUIREMENTS DOE 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	ES-202N and ANS 15.4-1988 recommends a High School diploma or equivalent	Requires a High School diploma	Same as DOE 5480.20
EXPERIENCE	Sufficient training at the facility or elsewhere to satisfy the requirements for certification (ANS 15.4-1988)	Based on the ability to meet position selection criteria	Same as DOE 5480.20
TRAINING	Training on the following: Principles of reactor facility operation; Facility design and operating characteristics; Instrumentation and control; Procedures and technical specifications; Radioactive materials handling; Regulations (ES-202N and ANS 15.4 - 1988) Training adequate to ensure safe operation of the facility, and include operation of the reactor and its systems under control of a licensed operator (ES-202N) Manipulation of the controls during 5 significant changes in reactivity or power level (ES-202N)	Same as ES-202N and ANS 15.4 - 1988 Addition: Other categories and topics applicable to the facility and job requirements General employee training Probabilistic risk Assessment training Exception: 5 significant changes in reactivity or power level are not specifically required. However, control manipulations are required to include reactivity manipulations in any combination of reactor startups, shutdowns or significant reactivity changes.	Same as DOE 5480.20 Addition: Manipulation of the controls of the reactor during 5 significant reactivity changes

TECHNICIANS

	NRC GUIDANCE NUREG-1478/ES-202N Rev. 0 or ANS 15.4-1988	PAST DOE MINIMUM REQUIREMENTS DOE 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	Requirement not specified	Requirement not specified	Same as DOE 5480.20
EXPERIENCE	1 year working in specialty or craft; Qualified to perform work unique to position (ANS 15.4-1988)	1 year job-related	Same as DOE 5480.20
TRAINING	Because of experience required, additional technical training may not be required Training covering general facility operations, administrative controls and procedures, and radiation protection as pertinent to job requirements (ANS 15.4-1988)	Specific training to improve knowledge and skills; Safety-related systems identified in the facility Safety Analysis Report for technicians who work on these systems General employee training	Same as DOE 5480.20

MAINTENANCE PERSONNEL

	NRC GUIDANCE NUREG-1478/ES-202N Rev. 0 or ANS 15.4-1988	PAST DOE MINIMUM REQUIREMENTS DOE 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	Requirement not specified	Requirement not specified	Same as DOE 5480.20
EXPERIENCE	1 year working in specialty or craft; Qualified to perform work unique to position (ANS 15.4-1988)	1 year maintenance-related	Same as DOE 5480.20
TRAINING	Technician section also addresses maintenance personnel therefore training is the same as for the technician position (ANS 15.4-1988)	Specific training to improve knowledge and skills; Safety-related systems identified in the facility Safety Analysis Report for technicians who work on these systems General employee training	Same as DOE 5480.20

TECHNICAL SUPPORT PERSONNEL

	NRC GUIDANCE NUREG-1478/ES-202N Rev. 0 or ANS 15.4-1988	PAST DOE MINIMUM REQUIREMENTS DOE 5480.20	CURRENT DOE MINIMUM REQUIREMENTS DOE 5480.20A
EDUCATION	Position not addressed	Baccalaureate in engineering or related science	Same as DOE 5480.20
EXPERIENCE	Position not addressed	2 years job-related -1 year nuclear	Same as DOE 5480.20
TRAINING	Position not addressed	Facility-specific: Facility organization; Facility fundamentals (as applicable) -- Heat transfer, fluid flow and thermodynamics, Electrical science, Nuclear physics, Chemistry/Chemistry controls, Process controls; Facility systems, components, and operations; Simulator training (if applicable); Codes and standards overview; Facility document system; Safety Analysis Reports and Technical Safety Requirements; Nuclear criticality control; Material, maintenance and modification control; ALARA and radwaste reduction program; QA/QC practices; Environment, Safety, and Health Orders General employee training Probabilistic Risk Assessment training	Same as DOE 5480.20

SECTION 4

COMPARISON OF DOE NONREACTOR NUCLEAR FACILITIES

AND

NRC-LICENSED NONREACTOR NUCLEAR FACILITIES

NONREACTOR NUCLEAR FACILITY
QUALIFICATION, EXPERIENCE AND TRAINING REQUIREMENTS

A. NRC REQUIREMENTS

1. Title 10, Code of Federal Regulations, Part 19, Notices, Instructions, and Reports to Workers; Inspections, contains requirements for training in subjects related to radiological protection.

2. Title 10, Code of Federal Regulations, Part 50 (10CFR50), Domestic Licensing of Production and Utilization Facilities, does not contain specific requirements for the qualification, experience, and training of personnel at licensed production facilities. Production facilities are defined as reactors designed or used primarily for the formation of plutonium or uranium-233; or any facility designed or used for the separation of the isotopes of plutonium; or any facility designed or used for the processing of irradiated materials containing special nuclear material. 10CFR50 requires a preliminary plan for the training of personnel be included as part of the Preliminary Safety Analysis Report, and that personnel qualification requirements and plans for an operator requalification program be included as part of the Final Safety Analysis Report.

3. Title 10, Code of Federal Regulations, Part 70, Domestic Licensing of Special Nuclear Materials, requires, as part of the license application, that technical qualifications, including training and experience of the applicant and staff be included. The measurement and control program requires establishment of procedures and performance criteria for training, qualification, and periodic requalification of personnel who perform samples and measurements for materials control and accounting purposes. Specific training is not identified.

4. Title 10, Code of Federal Regulations, Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste, requires that a program be established for personnel training, proficiency testing, and certification. This must be submitted with the license application. Specific training is not identified.

5. Nuclear Regulatory Commission Division 3 Regulatory Guides, Fuels and Materials, contain additional guidance for licensed commercial nuclear facilities. The most detailed guidance is contained in Regulatory Guide 3.25, Standard Format and Content of Safety Analysis Reports for Uranium Enrichment Facilities, and Regulatory Guide 3.26, Standard Format and Content of Safety Analysis Reports for Fuel Reprocessing Plants. These Regulatory Guides address the need to include the following into the Safety Analysis Report:

- A description of the proposed minimum personnel qualification requirements for plant operating, technical, and maintenance personnel, and assignment of responsibility for training programs and training records.

- A description of the proposed training program, including the scope of training in:

  - plant operations and design
  - instrumentation and control
  - methods of dealing with operating malfunctions
  - decontamination procedures
  - emergency procedures
  - sources and nature of radiation
  - methods of controlling contamination
  - interactions of radiation with matter
  - biological effects of radiation

- use of monitoring equipment

- principles of criticality control

- A description of the program for continuing training that provides additional materials and refresher training.

B. PAST DOE REQUIREMENTS

1. On November 2, 1989, DOE issued DOE Order 5480.18, Accreditation of Performance-Based Training for Category A Reactors and Nuclear Facilities. This Order requires performance-based training for operations, maintenance, and technical support personnel. The DOE training accreditation program is modeled after the Institute of Nuclear Power Operations (INPO) accreditation program, and contains content and process improvements which are based on the experience gained by INPO. The program applies to Category A reactors and high-hazard and selected moderate-hazard non-reactor nuclear facilities. The Order was revised on July 19, 1991, and reissued as DOE Order 5480.18A.

   DOE Order 5480.20 recommends that a systematic approach to training, such as performance-based training, be used for developing and implementing training programs for operations, maintenance, and technical support training programs at all DOE nuclear facilities. General requirements contained in DOE Order 5480.20 for all non-reactor nuclear facilities include the following elements:

   - Establishment of a training organization

   - Training of subcontracted personnel

   - Personnel selection

   - Qualification process

- Certification process
- Initial and continuing training
- General employee training
- Probabilistic risk assessment training
- Maintenance personnel training
- Technical support personnel training
- Management and supervisory training
- Operator and supervisor examination and reexamination requirements
- Requalification requirements
- Exceptions to training requirements
- Extension of certification/qualification
- Alternatives to education and experience
- Limitations for overtime worked
- Training records

2. Specific requirements include the following elements:

- Entry level education and experience

- Medical examinations
- Facility Staffing
- Operator training on the following core subjects:
  - industrial safety
  - instrumentation and control
  - basic physics
  - chemistry
  - industry operating experience
  - major facility systems
- On-the-job and classroom-type training for operators to include:
  - normal procedures
  - emergency actions
  - radiation control practices
  - location and functions of pertinent safety systems and equipment
  - configuration control procedures
  - procedures for making changes or alterations in operations

- operational safety requirements

• Additional training for fissionable material handlers in:

  - instrumentation and control; including types of instruments and control systems, principles of operation, and consequences of malfunctions

  - facility operating characteristics; including principal features, operating parameters, and operating limits of the facility (to include auxiliary systems)

  - principles of nuclear facility operation; including the processes involved and technical terminology for the chemical, physical, and metallurgical reactions and criticality safety principles, controls, and specifications

• Additional supervisor training in:

  - design, control, and operating limitations for the facility, including instrumentation characteristics and adjustment, facility operation, facility console control mechanisms, and control room manipulations

  - procedures for making design and operating changes, including changes in operating procedures

  - radiation hazards which may arise during the performance of experiments

  - nuclear and radiation theory, including details of the fission process, neutron multiplication, source effects, and neutron poison effects

  - specific operating characteristics of the facility, such as causes and effects of temperature and pressure changes

- procedures and limitations involved in initial equipment loading, alterations in fissionable material configuration, and determination of various internal and external effects on criticality safety

- procedures, equipment, and facilities available for handling and disposing of radioactive materials and effluents

- functions, assignments, and responsibilities of the maintenance organization as related to facility safety

- applicable portions of the facility Safety Analysis Report

• Operator, fissionable materials handler, and supervisor proficiency

C. CURRENT DOE MINIMUM REQUIREMENTS

On August 31, 1994, DOE Order 5480.18A was revised and renamed DOE Order 5480.18B, Nuclear Facility Training Accreditation Program. DOE Order 5480.18B applies to selected nuclear facilities and endorses a systematic approach to training.

DOE Order 5480.20A requires that a systematic approach to training be used for developing and implementing training programs for operations, maintenance, and technical staff positions at all DOE nuclear facilities. A graded approach to training is suggested based on the nuclear facility hazard category and the nuclear safety-related risk associated with operations.

General requirements contained in DOE Order 5480.20A are essentially the same as DOE Order 5480.20 with clarification added based on experience with the implementation of the Order. Several areas were deleted or added as follows:

Areas Deleted:

1. Facility staffing requirements.

2. Limitations for overtime worked.

Areas Added:

1. Certified operator written examination contents.

2. Certified supervisor written examination contents.

3. Operational evaluation contents.

4. Control manipulation requirements.

D. CONCLUSIONS

As indicated by this comparison, past and current DOE non-reactor nuclear facility personnel selection, qualification and training requirements meet or exceed any specified NRC regulatory requirements and guidelines for licensed commercial production nuclear facilities.

SECTION 5

REFERENCES

REFERENCES

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13. DOE 5480.5, SAFETY OF NUCLEAR FACILITIES, of September 23, 1986.

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